

WU : Solve the system using
an inverse matrix ($A^{-1} \cdot B = X$)

$$-1.5x = -30$$

$$2x - 3y = 10$$

$$[A]^{-1} \cdot [B] = \begin{bmatrix} -1.5 & 0 \\ 2 & -3 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -30 \\ 10 \end{bmatrix}$$



Solve a system using Cramer's Rule


$$ax + by = e$$

$$cx + dy = f$$

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$x = \frac{\begin{vmatrix} e & b \\ f & d \end{vmatrix}}{\det A}$$

$$y = \frac{\begin{vmatrix} a & e \\ c & f \end{vmatrix}}{\det A}$$

Ex.  $9x + 4y = -6$
 $3x - 5y = -21$

$$ax + by = e$$

$$cx + dy = f$$

① $\det A = \begin{vmatrix} 9 & 4 \\ 3 & -5 \end{vmatrix} = 9 \cdot (-5) - 3 \cdot 4 = -45 - 12$

$$\boxed{\det A = -57}$$

② $x = \frac{\begin{vmatrix} -6 & 4 \\ -21 & -5 \end{vmatrix}}{\det A} = \frac{-6 \cdot (-5) - (-21) \cdot 4}{\det A}$
 $= \frac{30 + 84}{\det A} = \frac{114}{-57}$
 $\boxed{x = -2}$

③ $y = \frac{\begin{vmatrix} 9 & e \\ 3 & f \end{vmatrix}}{\det A} = \frac{\begin{vmatrix} 9 & -6 \\ 3 & -21 \end{vmatrix}}{-57} = \frac{9 \cdot (-21) - 3 \cdot (-6)}{-57}$
 $= \frac{-189 + 18}{-57}$

$$y = \frac{-171}{-57} = \boxed{3}$$

$$\begin{aligned} 3x - 4y &= -15 \\ 2x + 5y &= 13 \end{aligned}$$

$$x = \frac{\begin{vmatrix} 0 & b \\ f & a \end{vmatrix}}{\det A}$$

$$y = \frac{\begin{vmatrix} a & 0 \\ c & f \end{vmatrix}}{\det A}$$



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$$\begin{vmatrix} 3 & -4 \\ 2 & 5 \end{vmatrix} = 15 - -8 = \boxed{23}$$

$$x = \frac{\begin{vmatrix} -15 & -4 \\ 13 & 5 \end{vmatrix}}{-23} = \frac{-15 \cdot 5 + 4 \cdot 13}{-23} = \frac{-23}{23} = \boxed{-1}$$

$$y = \frac{\begin{vmatrix} 3 & -15 \\ 2 & 13 \end{vmatrix}}{23} = \frac{3 \cdot 13 - 2 \cdot -15}{23} = \frac{39 + 30}{23} = \frac{69}{23} = \boxed{3}$$

$$\begin{matrix} \text{top} \\ \hline \begin{bmatrix} a & b \\ c & d \end{bmatrix} \end{matrix} \times \begin{matrix} \text{left} \\ \hline \begin{bmatrix} e & f \\ g & h \end{bmatrix} \end{matrix}$$

$$= \begin{bmatrix} \begin{matrix} \text{top} \\ \text{left} \end{matrix} \end{bmatrix}$$

